How Can GOES Contribute to Radiation Protection in Aviation?

Matthias M. Meier & Daniel Matthiä

Radiation Biology, Institute of Aerospace Medicine, DLR

DLR

Future Goal: SWx Information for Aircrew with Index D

Definition:

D is based on the dose rate $\dot{E}_{sol}$ and the smallest natural number to satisfy the inequality:

$$\dot{E}_{sol} < 5 \frac{\mu Sv}{h} \cdot 2^{D}$$

Assessment of D:

Model calculations

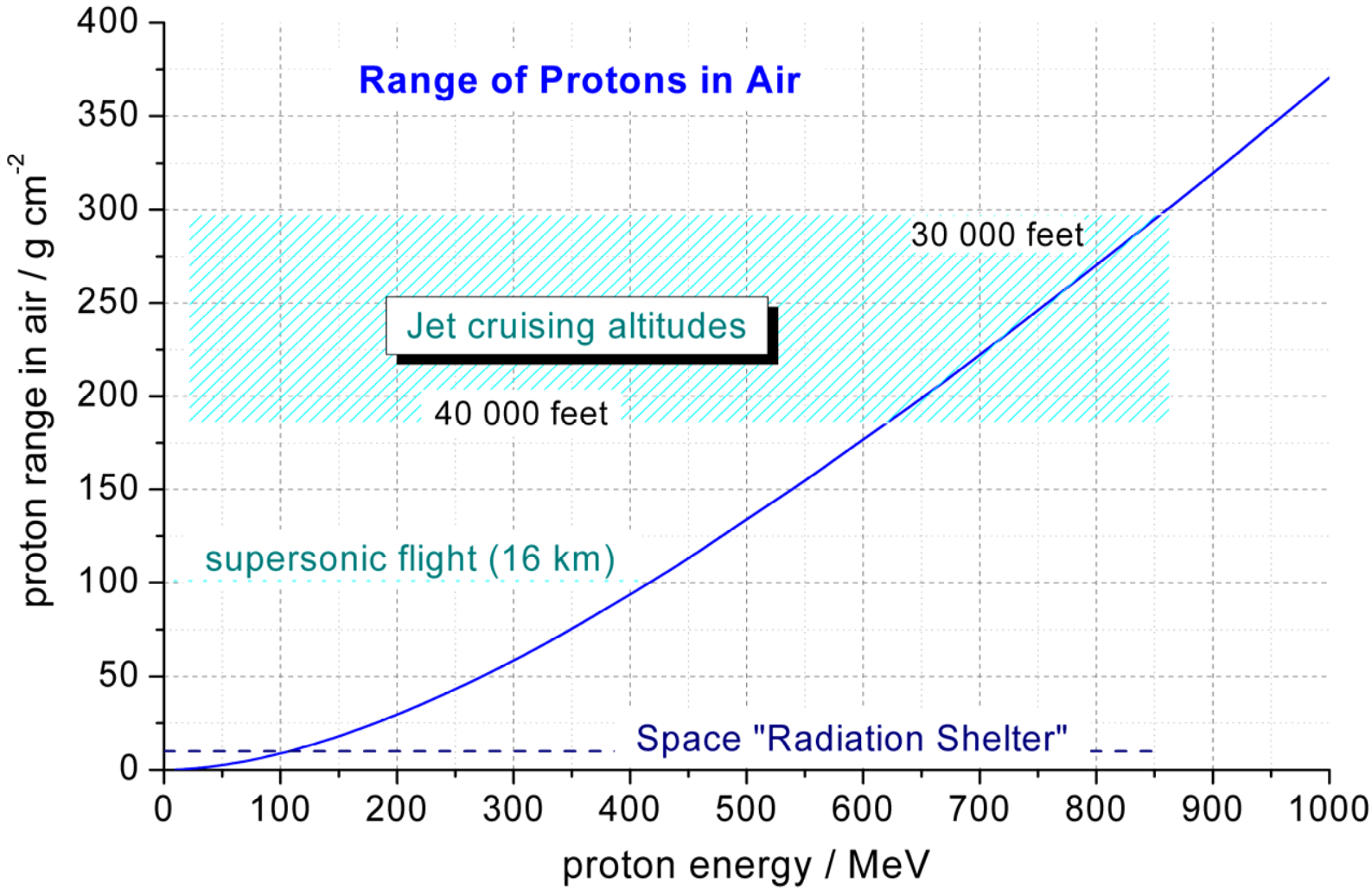
General requirement:

Information about the energy spectrum of the impinging solar particles

Index D	Dose rate interval [µSv/h]
0	$\dot{E}_{sol} < 5$
1	$5 \leq \dot{E}_{sol} < 10$
2	$10 \leq \dot{E}_{sol} < 20$
3	$20 \leq \dot{E}_{sol} < 40$
4	$40 \leq \dot{E}_{sol} < 80$
5	$80 \leq \dot{E}_{sol} < 160$
6	$160 \leq \dot{E}_{sol} < 320$
7	$320 \leq \dot{E}_{sol} < 640$
8	$640 \leq \dot{E}_{sol} < 1280$

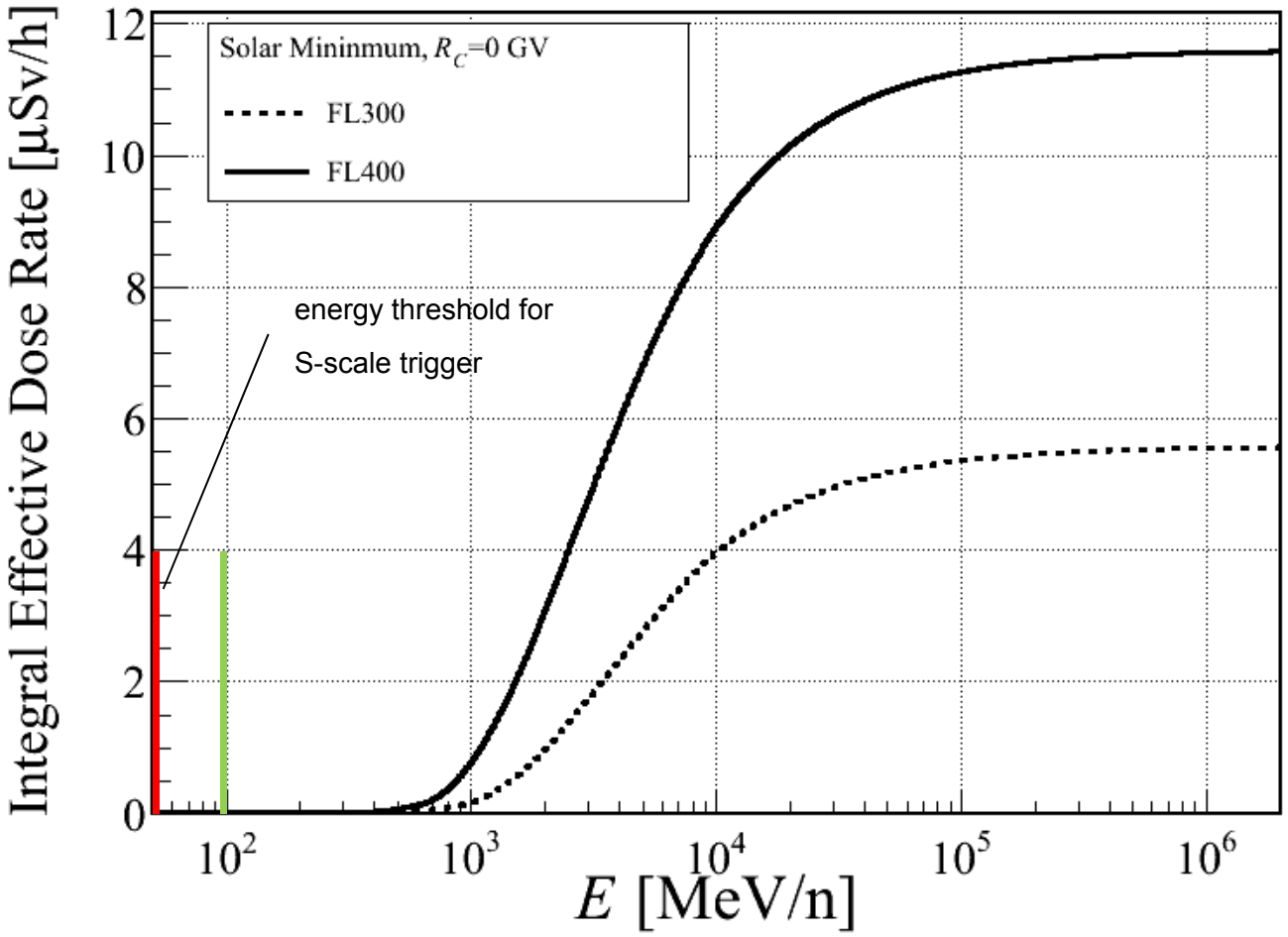
…to be continued….

Atmospheric Shielding: Range of Protons in the Atmosphere



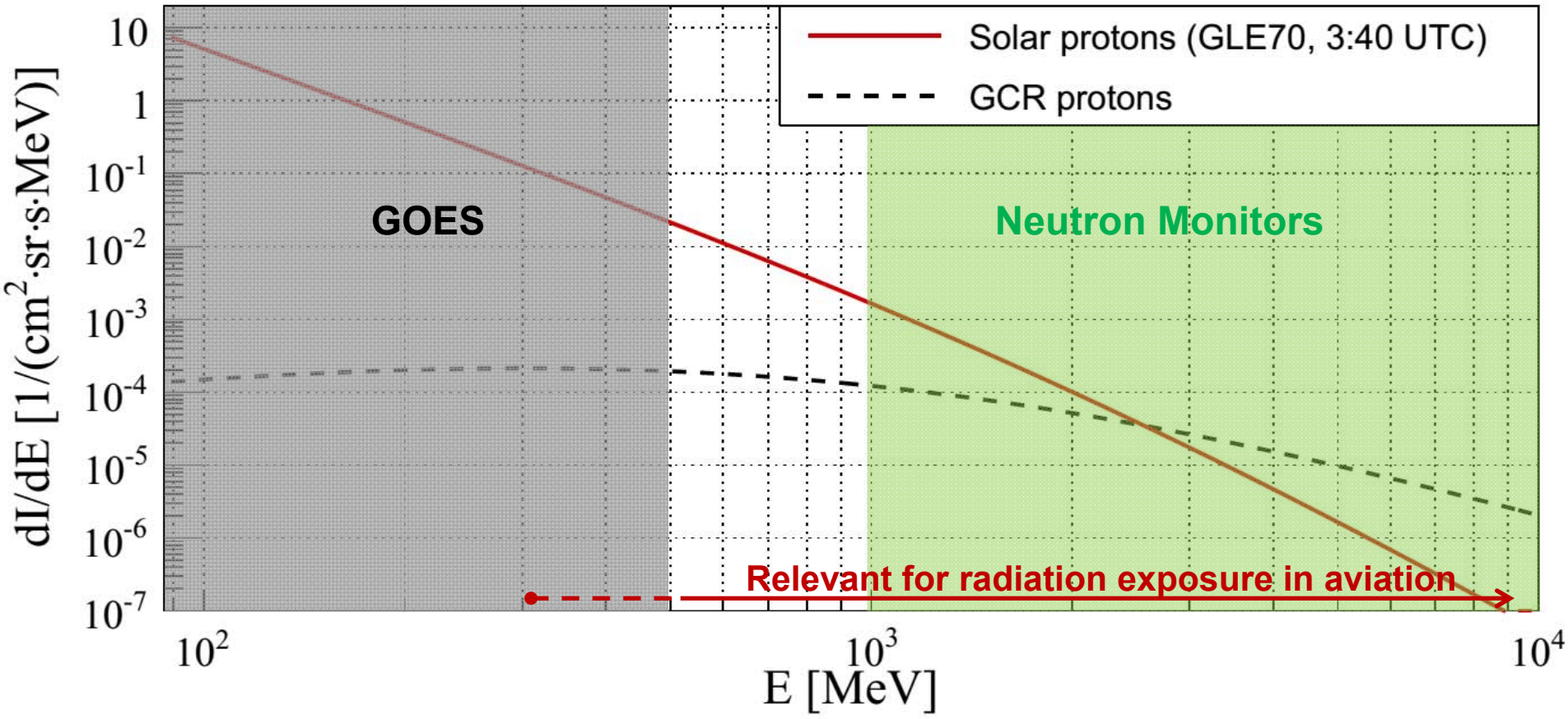
DLR

What energy is relevant (Simulation with PANDOCA)?



DLR

GLE70, 13th December 2006: Primary Proton Spectra



DLR

Summary

- Timely information on the radiation field at aviation is a prerequisite for mitigation measures (e.g. temporary lowering flight altitudes, etc.).

- Information is based on dose rates due to additional solar contributions (SWx Index D), which can be assessed by model calculations.

- Quality of model calculations depends on the input spectra of the impinging particles, which can be derived by NM and satellite measurements (e.g. GOES).

Further information:

http://www.swsc-journal.org/articles/swsc/abs/2014/01/swsc140002/swsc140002.html

J. Space Weather Space Clim. 4 (2014) A13
DOI: 10.1051/swsc/2014010

SWSC

REGULAR ARTICLE OPEN ACCESS

A space weather index for the radiation field at aviation altitudes

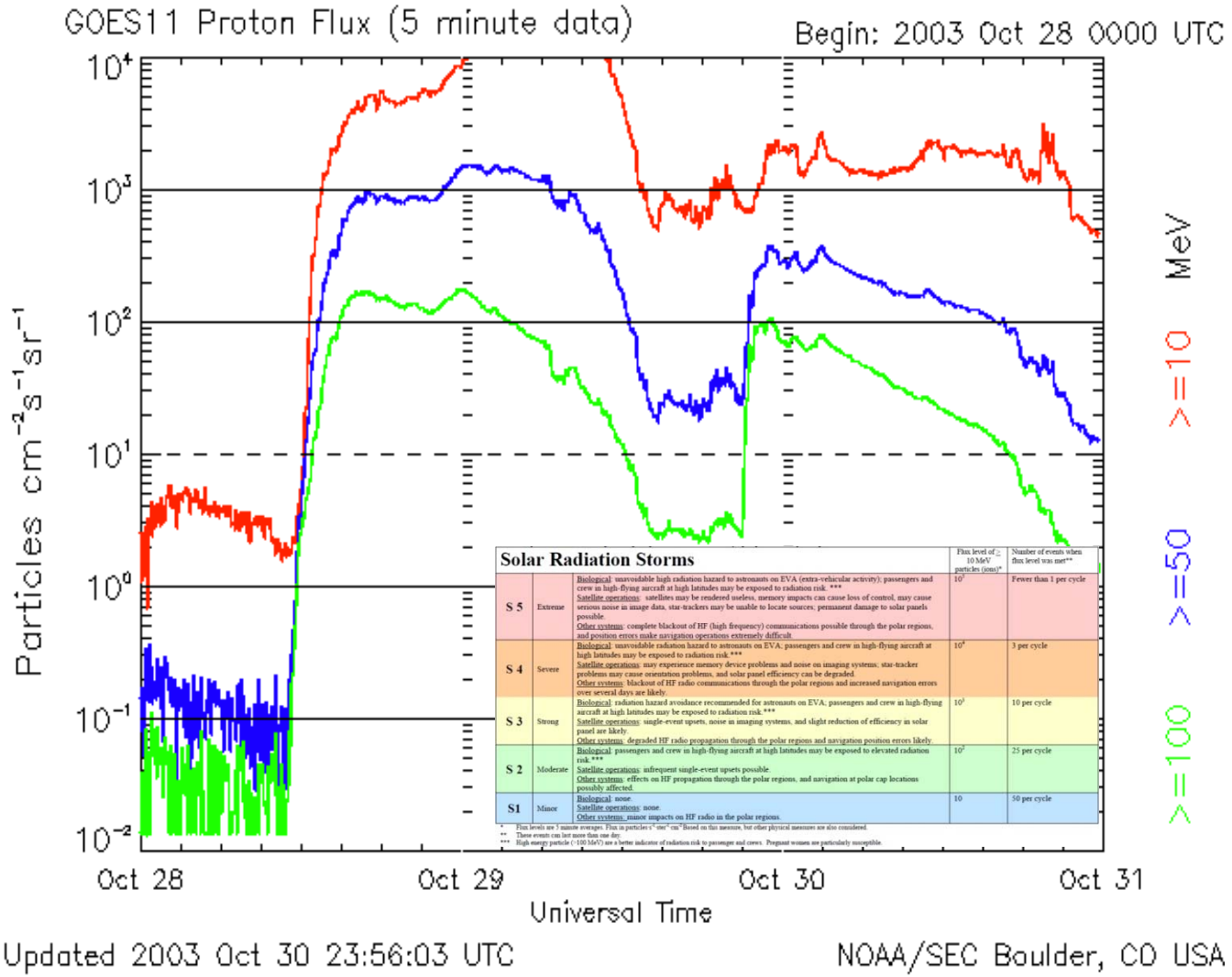
Matthias M. Meier* and Daniel Matthiä

German Aerospace Center, Institute of Aerospace Medicine, Linder Höhe, 51147 Köln, Germany
*Corresponding author: Matthias.Meier@dlr.de

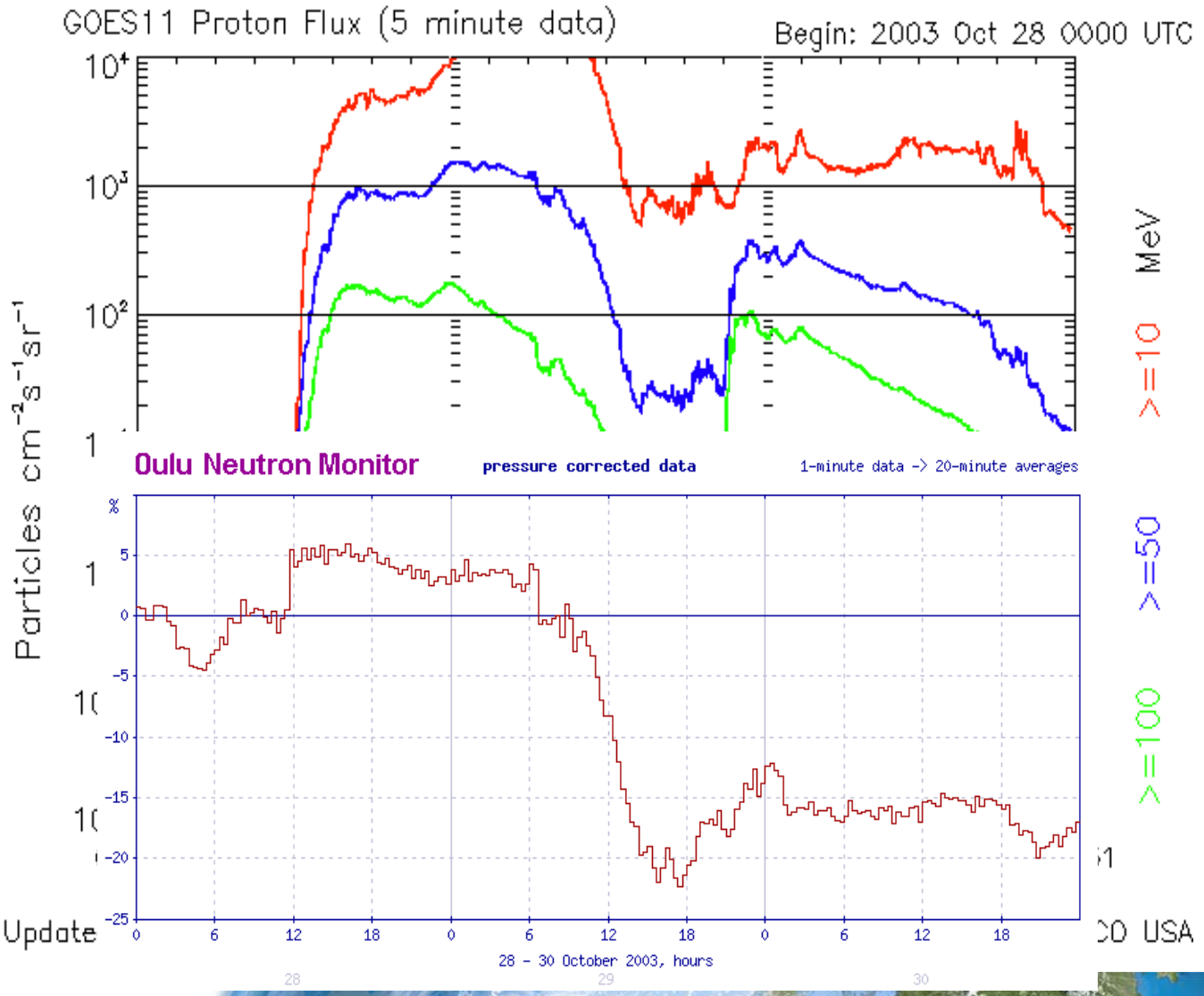
Received 24 January 2014 / Accepted 28 March 2014

DLR

GLE 65/66: 28.-31. October 2003

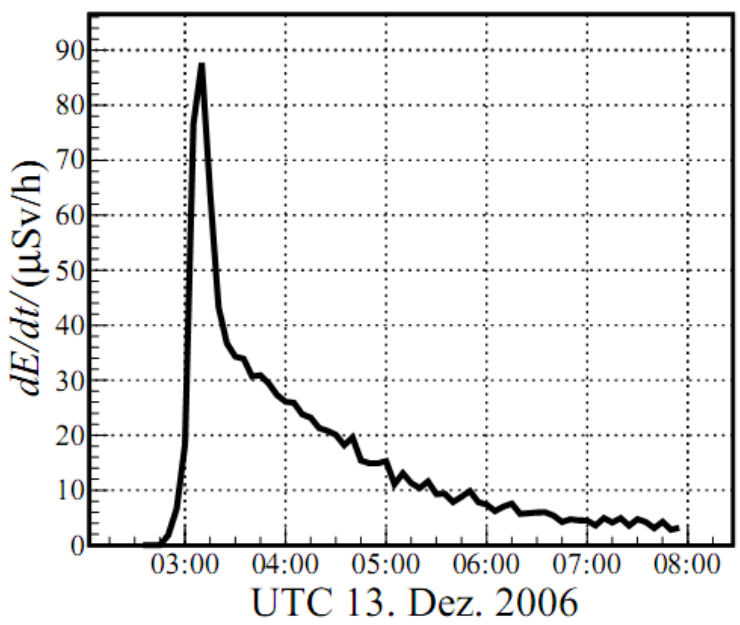


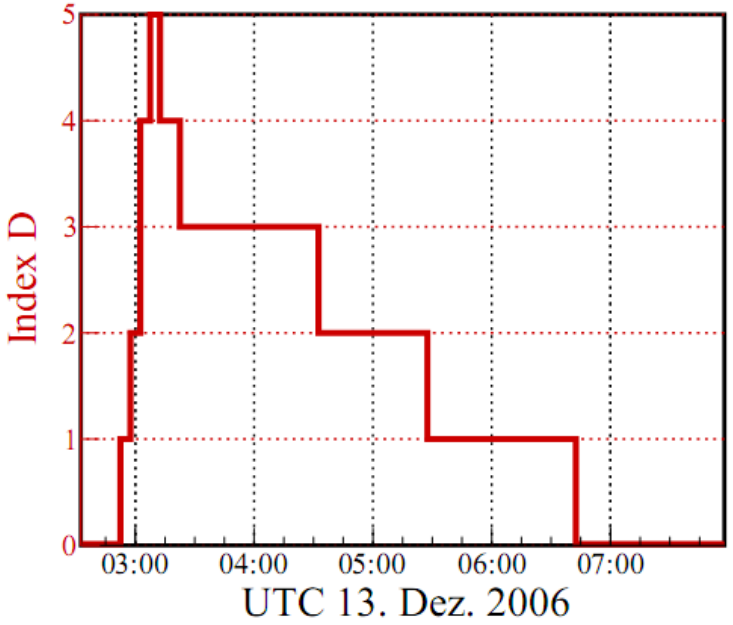
GLE 65/66: 28.-31. October 2003



GLE 70, 13.12.2006: SWx Index D @ FL410, 70N, 50E

Dose assessment with PANDOCA*



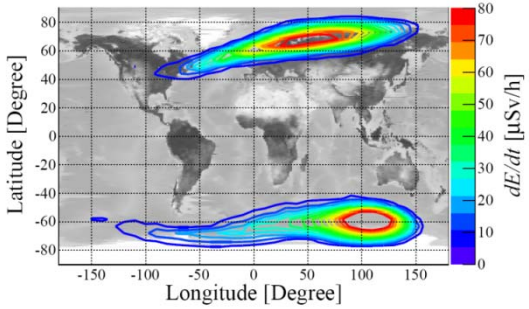


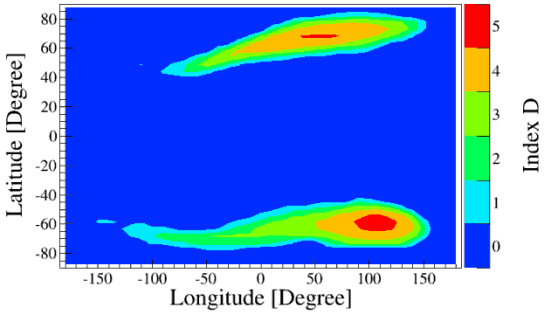
* Matthiä, D., M. M. Meier, and G. Reitz (2014), Numerical calculation of the radiation exposure from galactic cosmic rays at aviation altitudes with the PANDOCA core model, Space Weather, 12, 161–171, doi:10.1002/2013SW001022.

DLR

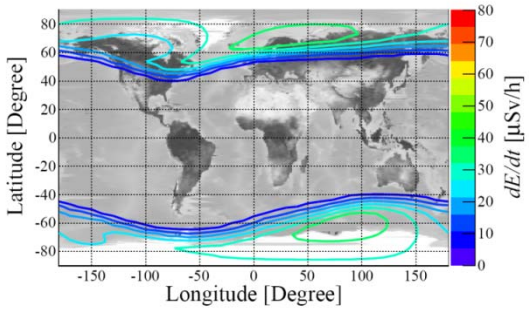
GLE 70, 13.12.2006: SWx Index D @ FL410*

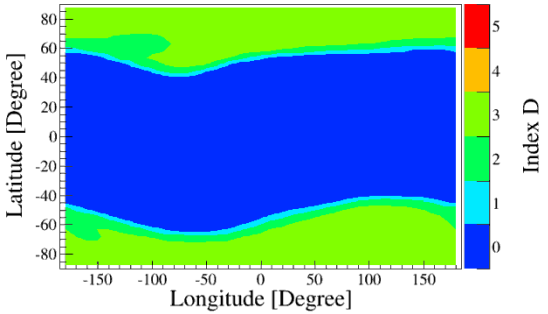
3:10 UTC





3:35 UTC





* Matthias M. Meier and Daniel Matthiä, A space weather index for the radiation field at aviation altitudes, J. Space Weather Space Clim. Volume 4, (2014) A13, doi:10.1051/swsc/2014010

DLR